

# Scatter and Obsolescence of Journals Cited in Dissertations of Librarianship: The Case of Hacettepe University

## Abstract

This paper analyzes the bibliometric features of 100 dissertations completed at the Department of Librarianship of Hacettepe University between 1974 and 2002. Doctoral dissertations were, on average, twice as long as that of master's and contained 2.5 times more citations. Monographs received more citations (50%) than journal articles did (42%). Fourteen (or 3.2% of all) journal titles (including *Türk Kütüphaneciliği*, *College & Research Libraries*, and *Journal of the American Society for Information Science*) received almost half (48.9%) of all citations. Eighty percent of journal titles were cited rather infrequently. No correlation was found between the frequency of citations of the most frequently cited journals and their impact factors. Cited journal titles in master's and doctoral dissertations overlapped significantly. The distribution of citations to foreign journal titles fitted the Bradford Law. The mean half-life of all cited sources was nine years. Sources cited in master's dissertations were relatively more current. Single authorship was the norm in cited resources. Findings can be used to evaluate library collections and develop a core journals list in librarianship.

## 1. Introduction

The description of the source of an idea or the concept of "citation" was developed after the Renaissance and the first use of footnotes similar to citations goes well back to the 16<sup>th</sup> century (White, 1985). The main function of a citation is to establish a relationship between the citing and cited documents. Citations can be used to evaluate the relevant sources as well

as to support the validity of author's statements and to provide a more extensive reading list for the initiated researchers (White, 1985, pp. 38-39; Smith, 1981, pp. 84-85).

Citation indexing was first used in 1873 when *Shepherd's Citations* was published. In mid-1950s, Eugene Garfield, the founder of the Institute for Scientific Information (ISI), had noticed the importance of citation indexes in studying the literature growth and the use, organization and management of the most frequently cited sources. ISI has been publishing *Science Citation Index*, *Social Science Citation Index* and *Arts and Humanities Citation Index* since early 1960s (White, 1985, p. 39).

Several researchers have used citation analysis to study the scatter and obsolescence of the literature in a given subject, the productivity of authors, and to determine the most frequently used sources in library collections. Cited sources in both journal articles and dissertations have been studied in the past (Meadows, 1967; Line, 1970; LaBorie & Halperin, 1976; Garfield, 1980; Smith, 1981; Rousseau, 1988; Zipp, 1996; Kuyper-Rushing, 1999; Gooden, 2001, Kushkowski, Parsons & Wiese, 2003).

Formulated in 1934, Bradford's Law of Scattering "describes how the literature on a particular subject is scattered or distributed in the journals" (Garfield, 1980, p.5). It was observed that the vast majority of articles on a particular subject is published in a relatively small number of "core" journals. In other words, journals can be ranked according to the law of diminishing returns. The Bradford Law enables us to determine the core journals in any given subject or scientific discipline. Moreover, it was also observed that the current literature gets cited more often in the articles published in scientific journals (Meadows, 1967; Earle & Vickery, 1969). As the literature gets aged, it receives fewer and fewer citations. This phenomenon is known as "aging" or "obsolescence". The measure "half-life, defined as "the median age of cited or requested sources", can be used to study the obsolescence of literature (Earle & Vickery, 1969, p.132; Line, 1970, p. 6).

This paper investigates the bibliometric features of a total of 100 dissertations completed at the Department of Librarianship of Hacettepe University between 1974 and 2002; analyzes the distribution of cited sources in scientific journals to see if it fits the Bradford Law; and measures the literature obsolescence in librarianship.

## **2. Problem Statement**

Theses and dissertations contain most valuable data on scholarly communication process. Bibliometric and citation characteristics of dissertations have been studied in the past with a view to identify the basic features of the scholarly communication process in different scientific disciplines. The scatter and obsolescence of cited sources that appear in the bibliographies of dissertations have been used not only to identify core journal titles in specific subject fields but also to develop theories that can be used in collection management decisions and scientometric evaluations.

This study addresses the following broader research question: To what extent can bibliometric and scientometric characteristics of dissertations in librarianship be used to formulate collection development policies in libraries? Findings to be obtained in such a study would likely help identify the most heavily used journal titles in librarianship along with the usage of their backruns. This would enable librarians, to a certain extent, to make use of such findings in articulating their collection management, retention, deselection, relegation and disposal policies. Moreover, it would be worthwhile to study to the applicability of the Bradford Law and the 80/20 Rule to the distribution of sources cited in dissertations of librarianship.

### 3. Literature Review

The first study of citation analysis was reported in 1927 by Gross and Gross who studied the cited sources in the bibliographies of articles published in the *Journal of the American Chemical Society* and used the results to develop a journal subscription policy for a college library in the United States (White, 1985, p. 39). Sengupta (1974) developed a core list of 275 medical journals based on cited sources that were listed in the references of articles that appeared in the *Annual Review of Medicine* between 1965 and 1969.

Similarly, bibliometric features of cited sources in dissertations have also been studied (e.g. Buttlar, 1999; Edwards, 1999; Gooden, 2001; Herubel, 1991; Kushkowsky et al., 2003; Kuyper-Rushing, 1999; LaBorie & Halperin, 1976; Sylvia & Leshner, 1995; Walcott, 1991, 1994; Zipp, 1996). The analysis of the cited sources in 61 dissertations of library and information science showed that the *College & Research Libraries* and *Journal of the American Society for Information Science* were among the most frequently cited journals (Buttlar, 1999). Monographs were cited more often than journal articles in dissertations in librarianship as well as in music and philosophy (LaBorie & Halperin, 1976, pp. 274-278; Kuyper-Rushing, 1999, p. 160; Herubel, 1991, p. 67). This pattern was also observed in other social science disciplines (Kushkowsky et al., 2003, p. 472). This is in contrast with citation patterns observed in dissertations of chemistry, geology and biology wherein more than 80% of all citations were for journal articles (Gooden, 2001; Walcott, 1991, p. 9; Walcott, 1994, p. 4). Journal articles received 64% of all citations in a cross-disciplinary study of citations taken from master's and doctoral dissertations completed at Iowa State University between 1973 and 1992, and some 85% of the cited sources were available in the university library (Kushkowsky et al., 2003, pp. 465-467). Almost half the cited sources were 20 years old or younger in librarianship (LaBorie & Halperin, 1976, p. 274-280).

Bibliometric studies are of interest recently in Turkey, too, although studies of citation analysis are rare (Yurtsever, Gülgöz, Yedekçioğlu & Tonta, 2002, 2001; Tonta & İlhan, 2002, 1997; Tonta, 2000; Yurtsever & Gülgöz, 1999; Denkel, Kâğıtçıbaşı, Pak & Pamuk, 1999). Kum (1974) selected a random sample of citations from articles published in 30 medical journals in 1950s, 1960s and 1970s and prepared a list of the most frequently cited journals. Although there was a high degree (89%) of overlap between the titles in the journal subscription list of Hacettepe University Medical Library and that of Sengupta mentioned earlier, only 57% of the back issues of the cited journals were available in the library (Kum, 1974, pp. 49-50). Journals with high impact factors were also studied with regards to their availability in the collections of university libraries in Ankara (Alkan, 1999, 1998).

In a general study of bibliometric features of contributions (articles, reviews, letters, etc.) authored by Turkish social scientists, 29 contributions that appeared in 12 different journals of library and information science were identified (Yurtsever et al., 2001; Gülgöz, Yedekçioğlu & Yurtsever, 2002). The average impact factor of those journals was higher than that of all such journals listed in the *Journal Citation Reports* (1998). The average citation per articles was 2.15. The average number of authors per contribution was 1.3.

Citation analysis studies in librarianship concentrated on the cited sources in articles appeared in the journal *Türk Kütüphaneciliği* (Journal of Turkish Librarianship) (Gürdal, 2002; Kurbanoğlu, 1996; Tonta, 2002). It appears that monographs were cited more often than journal articles and that the most frequently cited five journals [*Türk Kütüphaneciliği*, *Resmî Gazete* (Official Gazette), *College & Research Libraries*, *Library Trends*, *Library Journal*] received about one-third of all citations. Similar findings were obtained for the cited sources in doctoral dissertations (Bayram, 1998; Gökkurt, 1997a; Gökkurt, 1997b).

#### **4. Method**

This paper aims to study the bibliometric features of dissertations and determine the most frequently cited sources in librarianship. The following research questions were addressed:

- What types of sources (monographs, journal articles, etc.) get cited more often in librarianship?
- What are the most frequently cited journals in librarianship?
- Is there a relationship between the impact factors of journals and the number of citations they get?
- Does the distribution of citations to journals fit Bradford's Law of Scattering?
- Do citation trends in master's and doctoral dissertations differ?
- What is the rate of literature obsolescence in librarianship?
- Do cited sources in master's and doctoral dissertations differ in terms of their ages?

A total of 100 dissertations (78 master's and 22 doctoral) completed at Hacettepe University Department of Librarianship between 1974 and 2002 were used as data sources. Citation analysis technique was used to gather and evaluate data. Bibliographies or reference lists of dissertations were used to identify the cited sources. Sources cited in dissertations were categorized as "monographs" (e.g., books, proceedings, technical reports), "journals" (e.g., scholarly, scientific, and popular journals and magazines, newspapers), "electronic publications" (e.g., articles available through databases or web sites), "dissertations" (master's, doctoral, and post-doctoral dissertations), and "other publications" (e.g., unpublished manuscripts, interviews, archival documents). The journal title, language,

publication year, and author(s) of each cited source were recorded. The relationship between the most frequently cited journals in both master's and doctoral dissertations was tested using Spearman's rank order correlation coefficient (*rho*). Similarly, the relationship between the impact factors of cited journals as reported in ISI's *Journal Citation Reports* (ISI, 2002) and the number of citations they received in dissertations was tested using Pearson's correlation coefficient (*r*). The mean half-life of cited articles was calculated. The distribution and obsolescence of articles in cited journals in librarianship was studied to determine if they fit the Bradford's Law of Scattering. The authorship was also studied with regards to the nationality of the first author of each cited journal article.

## **5. Findings and Discussion**

On the average, about three (3.4 to be exact) dissertations were completed each year at the Department, although this figure fluctuates between zero and 10 (no dissertation was completed in 1981 while there were 10 in 1978). Considering that the Department accepts about 10 graduate students every year, it appears that only one-third of accepted students complete the programme. Further research is needed to identify the possible causes of the low completion rate.

An average dissertation was 171 pages long (SD=78, min=45, max. 450). (It was assumed that such features as the page size, line spacing and font size used in dissertations remained the same 1974 through 2002.) Doctoral dissertations were twice as long as master's dissertations (275 pages as opposed to 142 pages). As the length of a dissertation increases, so does the number of sources it cites.

Almost half (48%) of all dissertations were advised by two professors (N. Tuncer and İ. Çakın) while the rest were advised by 13 different ones. The number of professors with

Ph.D.'s who could act as advisers were limited in the early years. Therefore, an adjunct professor (O. Ersoy) who was based in Ankara University acted as an additional adviser.

Dissertations contained a total of 7019 citations (average=70, SD=58). The average number of citations in a doctoral dissertation (132) was 2.5 times higher than that of a master's dissertation (53). Monographs received half of all citations (7019) while journals did 42%, dissertations and electronic publications 3% each, and "other publications" 2% (Figure 1). The percentage of citations to monographs was higher in master's dissertations (52%) than that of doctoral dissertations (47%). Monographs were also used more heavily (53%) in articles that appeared in *Türk Kütüphaneciliği* (Journal of Turkish Librarianship) between 1987 and 2001 (Tonta, 2002, p. 282). It appears that the types of sources cited in journal articles and dissertations are similar and that monographs are used more often than journal articles in librarianship, which confirmed the findings of similar studies carried out in the past (LaBorie & Halperin, 1976, p. 278).

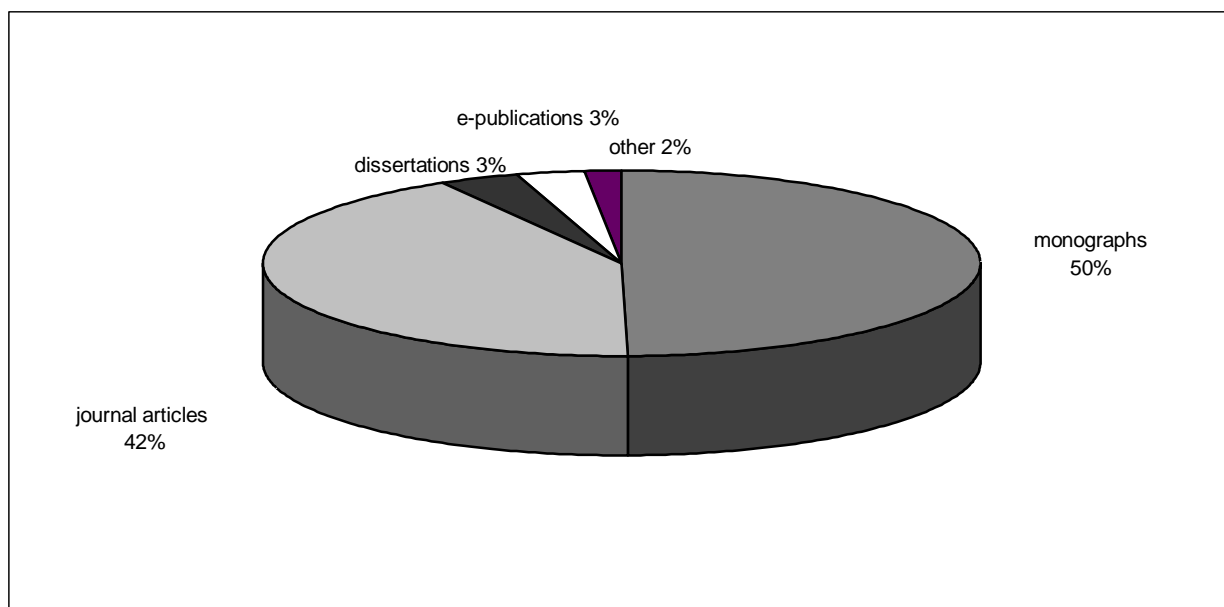


Figure 1. Distribution of citations by publication type ( $N = 7019$ )

More than half (55%) of all cited sources were in English. The rest were mainly in Turkish. Monographs and journal articles in English received more citations (52%) than



those in Turkish (42%), which can be attributed to the fact that Turkish literature in librarianship is limited. Some 45% of all citations to articles in Turkish were to those that appeared in the journal *Türk Kütüphaneciliği*.

The distribution of citations to journal titles is given in Figure 2. A mere 1 percent of all journal titles (or 5 journal titles) received one-third of all citations while 3.4% (or 15 journal titles) did half and about 9% (or 38 journal titles) did two-thirds of all citations. Some 18.5% (or 81 journal titles) of all journal titles satisfied 80% of all citation needs, confirming Trueswell’s famous 80/20 rule (Trueswell, 1969). More than 80% of all journal titles were hardly cited.

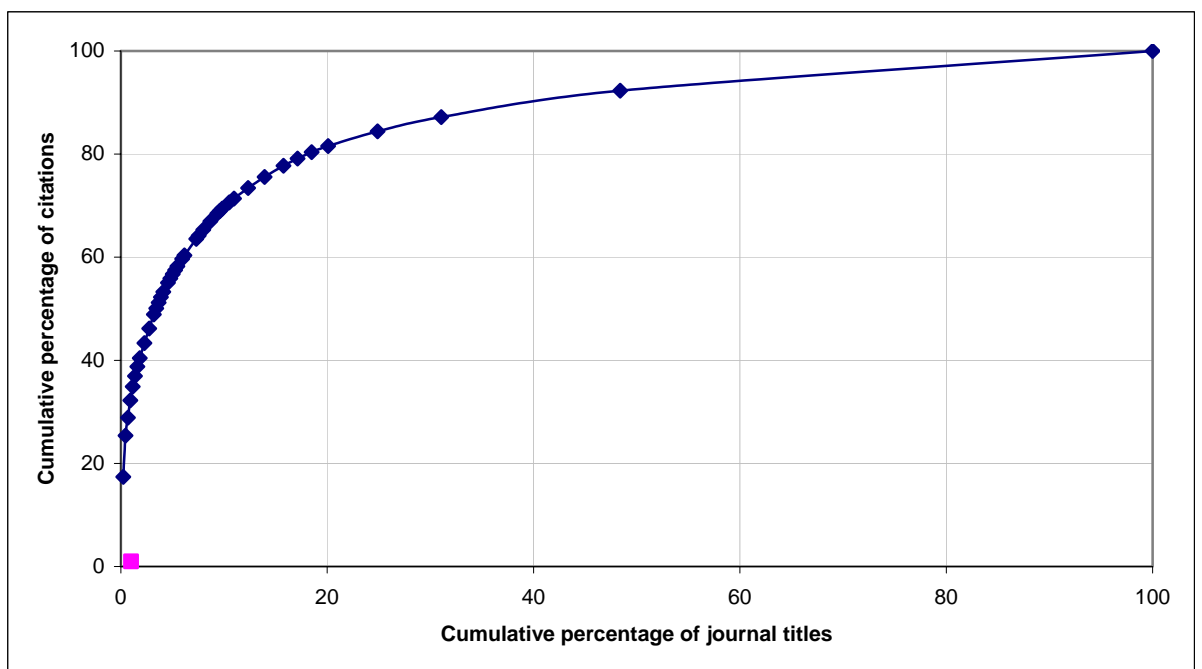


Figure 2. Distribution of citations to journal titles

Distributions similar to that given in Figure 2 can also be studied using concentration and evenness measures. Rousseau (2000, p. 2) describes concentration as “the relative apportionment of items among the sources present.” Lorenz curves and Gini coefficients as

concentration measures were originally developed to study income inequality in economics (Jacobson, Milman & Kammen, 2004). They are used as scientometric indicators to evaluate the distribution of citations in journal articles over journal titles (Rousseau, 2000, 1998). In a different context (energy consumption) Jacobson et al. (2004) describe Lorenz curves and Gini coefficients as follows:

The Lorenz curve is a ranked distribution of the cumulative percentage of the population of recipients on the abscissa versus the cumulative percentage of the resource distributed along the ordinate axis. The greater the distance this curve is from the diagonal line extending from the origin to the point with coordinates  $x = 1$  (or 100%),  $y = 1$  (or 100%), the greater the inequality in energy consumption. The Gini coefficient is a numeric measure of inequality that reveals the difference between a uniform distribution and the actual distribution of a resource. It is calculated from the Lorenz curve by taking the ratio between (a) the portion of the area enclosed by the diagonal line and the Lorenz curve and (b) the total area under the diagonal line of the uniform distribution. Formally, the Gini coefficient for energy consumption is calculated as

$$G_e = 1 - \sum_i (Y_{i+1} + Y_i)(X_{i+1} - X_i), \quad (1)$$

where  $X_i$  is the number of energy users in population group  $i$ /total population and  $Y_i$  the quantity of energy used by population group  $i$ /total energy use with  $Y_i$  ordered from lowest to highest energy consumption. The Gini coefficient ranges from perfect equity among all members of the population ( $G_e = 0$ ) to complete inequity ( $G_e = 1$ ). As more than one Lorenz distribution of a resource can lead to the same Gini value, it is often useful to employ both metrics simultaneously (p.2).

We applied both metrics to the distribution of citations over journal titles to draw the Lorenz curve and calculate the associated Gini coefficient (Figure 3). In our case,  $X_i$  in (1) is the number of journal titles in journal group  $i$  / total number of journal titles and  $Y_i$  is the number of citations in citation group  $i$  / total citations with  $Y_i$  ordered from lowest to highest number of citations. Figures 2 and 3 represent the same data in two different ways. Figure 2 draws attention to a small percentage of “core” journal titles receiving the relatively large percentage of total citations while Figure 3 concentrates on the large percentage of journal titles that were cited rather infrequently. Figure 3 brings forth the inequality in the distribution of citations over journal titles, which is further illustrated by the relatively high Gini coefficient of 0.75.

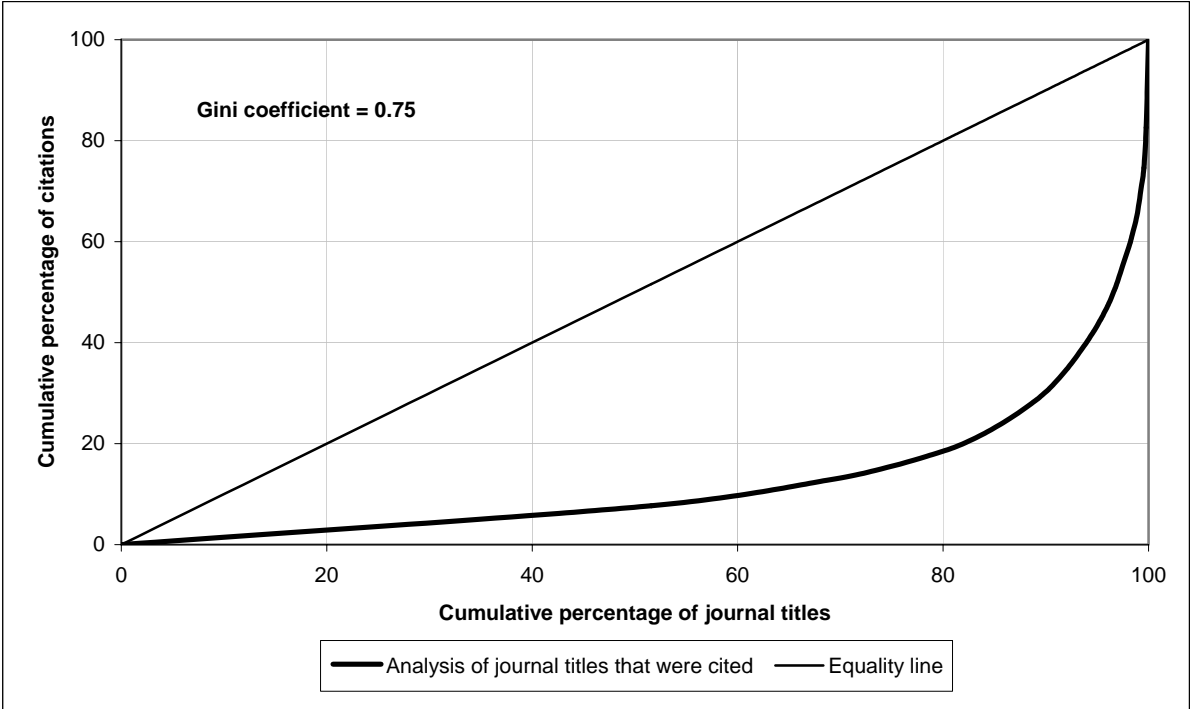


Figure 3. The Lorenz curve and Gini coefficient for the distribution of citations over journal titles

We conducted a test to see if the Bradford Law applies to the distribution of citations over journal titles. The total number of journal titles (438) were divided into approximately three equal regions on the basis of the number of total citations that journal titles received in each region (about one-third of all citations). Table 1 gives the number and percentages of journal titles along with those of citations for each region. The first one-third of all citations went to the most heavily cited 4 journal titles in the first region whereas the second one-third went to the moderately cited 34 journal titles. The last one-third of all citations went to a large number of infrequently cited 400 journal titles. In other words, highly- and moderately-cited 38 journal titles (a mere 8.7% of all journal titles) satisfied two-thirds of all citations.

Table 1. Distribution of citations to journal titles

Region	# of journal titles		# of citations	
	N	%	N	%
1	4	0.9	949	32.2
2	34	7.8	1023	34.7
3	400	91.3	973	33.0
<b>Total</b>	<b>438</b>	<b>100.0</b>	<b>2945</b>	<b>99.9</b>

*Note:* The total percentage of all citations is not equal to 100% due to rounding.

The distribution of all citations (2945) over 438 different journals (139 in Turkish, 299 in foreign, mainly English, languages) is further given in Figure 4, which appears to be a typical S-shaped Bradford-Zipf distribution. The graph increases non-linearly for the most heavily cited top 14 journals. Those top 14 journals constituted only 3.2% of all cited journals (438) yet they received almost half (48.9%) of all citations. The sharp increase observed up to the top 14 journals slows down gradually. The top 41 journals (9.4% of all titles) received more than two-thirds (68.5%) of all citations. Furthermore, some 88 journal titles received more than 80% of all citations. The increase further slows down after 88 titles. The remaining 350 journal titles (almost 80% of all cited journals) received only 18.4% of all

citations. Almost half (226) of all cited journals received only one citation each (8% of all citations).

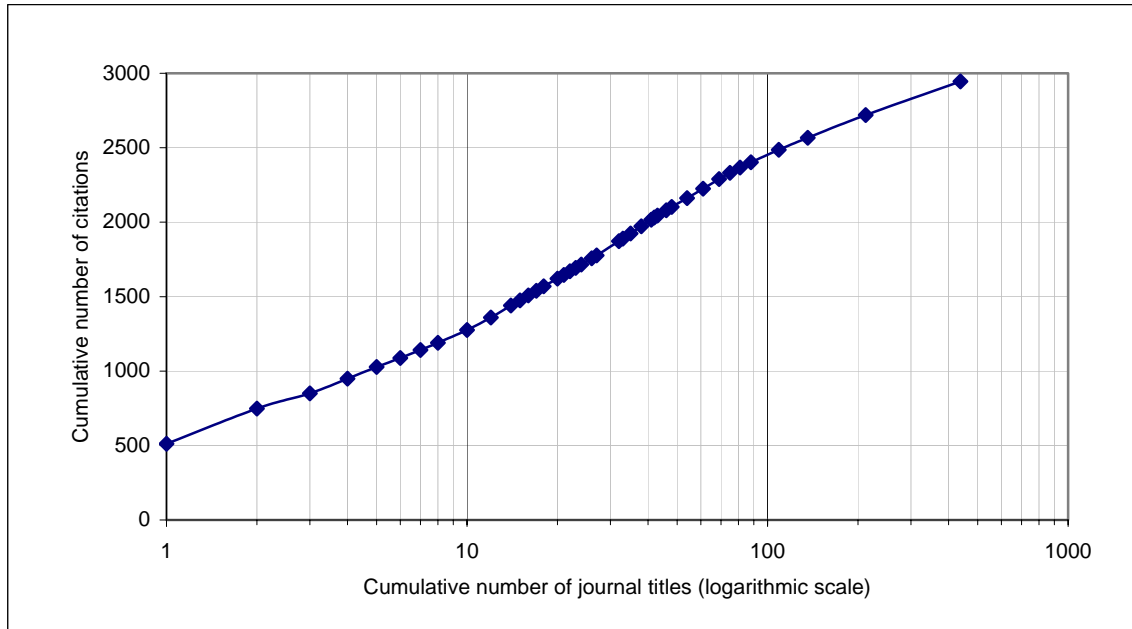


Figure 4. Distribution of citations to journal titles

Although figures in Table 1 and the S-shaped distribution depicted in Figure 4 seem to suggest the applicability of the Bradford's Law of Scattering to the distribution of citations over all journal titles, this was not the case. Yet, the distribution of citations to foreign journals fits the Law. This may be due to the fact that the two most heavily cited Turkish journals (*Türk Kütüphaneciliği* and *Resmî Gazete*) received a quarter of all citations whereas citations to foreign journal titles were not that lop-sided.

The top 14 journals that received almost half of all citations are given in Table 2. They can be considered as the “core journals” cited in Turkish dissertations of librarianship. As should be expected, *Türk Kütüphaneciliği* received the highest number of citations in dissertations (512 citations or about 17% of all citations to journal articles), followed by *Resmî Gazete* (236 citations or about 8% of all citations to journal articles), which is not a professional journal of librarianship *per se*. The remaining journal titles are all prestigious

library journals published in English. Such journal titles as *Information Technology & Libraries*, *Library Resources & Technical Services*, *Information Processing & Management*, *Library & Information Science Research*, *Journal of Information Science*, and *Journal of Academic Librarianship* were cited less frequently.

Table 2. The most heavily cited 14 journals in dissertations

<i>Journal name</i>	<i>No. of citations</i>	<i>Impact factor*</i>
Türk Kütüphaneciliği (Journal of Turkish Librarianship)	512	NA
Resmî Gazete (Official Gazette)	236	NA
College & Research Libraries	102	1.181
Library Trends	99	0.757
Library Journal	79	0.205
Journal of the American Society for Information Science	60	1.773
Unesco Bulletin for Libraries (discontinued)	54	NA
IFLA Journal	48	NA
Bulletin of the Medical Library Association	43	0.949
International Library Review	43	NA
Aslib Proceedings	42	0.368
Library Quarterly	42	0.500
Journal of Documentation	40	1.648
Libri	40	0.123

\* Source: ISI. *Journal Citation Reports* (2002).

The list of the most frequently cited journals compares well with similar studies (Kurbanoglu, 1996; Tonta, 2002). No statistically significant correlation was observed between the frequency of citations of the most frequently cited journals and their impact factors (Pearson's  $r = .197$ ,  $p = .28$ ), suggesting that the impact factor of a given journal cannot be used as a reliable indicator to predict the frequency of citations it receives in dissertations of librarianship.

The number of journals cited by both master's and doctoral dissertations was 106 (of which 79 were in English and 27 in Turkish). The rank order correlation between the lists of cited journals in master's and doctoral dissertations was statistically significant (Spearman's  $\rho = .563$ ,  $p < .01$ ), suggesting that the overlapping core journal titles were consistently cited both in master's and doctoral dissertations.

The publication years of all cited sources ranged between 1790 and 2002 (Figure 5). The mean half-life of sources cited in dissertations was nine years. Sources cited in master's dissertations were slightly younger than those of doctoral dissertations, suggesting that more current literature is cited in master's dissertations. The half-life for cited books and journal articles were 9.3 years and 9.6 years, respectively. The half-life for cited journals in foreign languages (eight years) was younger than that in Turkish (10 years) whereas the reverse was the case for books. This may be due to the fact that foreign journals provide more up-to-date information and they can be obtained more easily once they are subscribed to by libraries. Yet foreign books take longer to arrive in Turkish libraries and seem to appear some time later in the bibliographies of dissertations. The majority of sources cited in dissertations were published within the last 23 years.

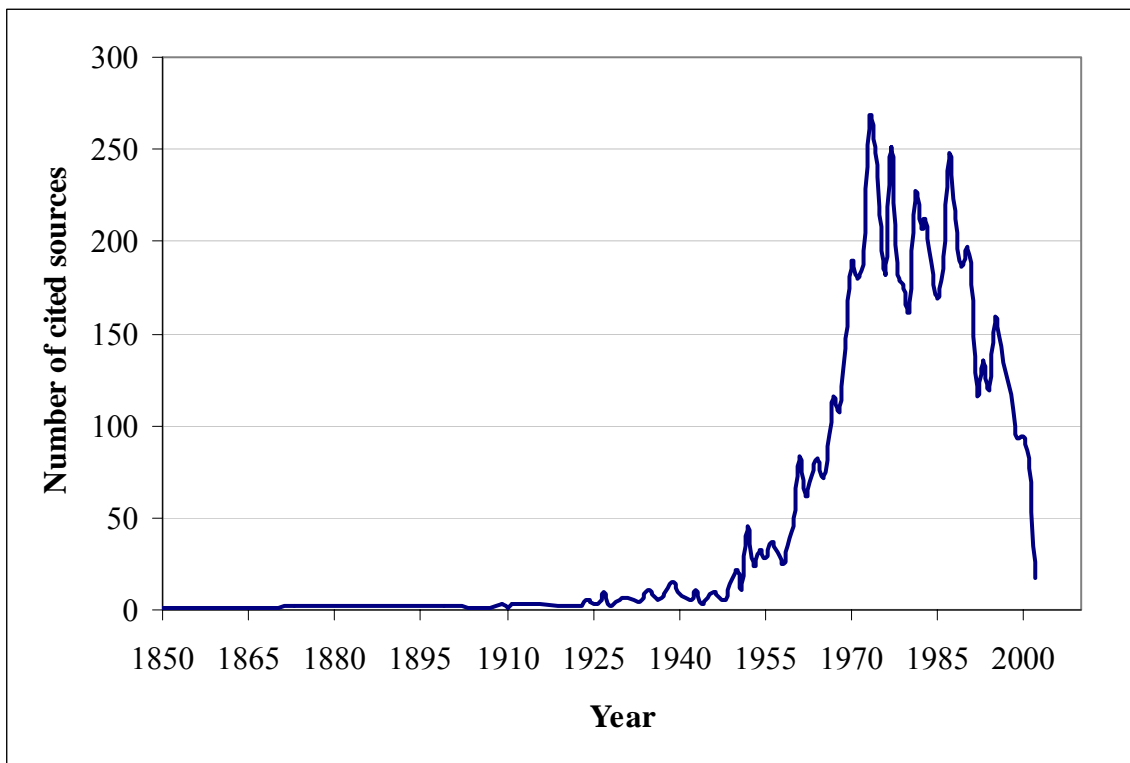


Figure 5. Distribution of citations by years ( $N = 7019$ )

The figures of half-lives and the distribution of ages of cited sources in dissertations were similar to those obtained in Turkish journal articles (TONTA, 2002, pp. 307-308). The

last five years of the journal literature received one-third of all citations in our study. This period was found as eight years for doctoral dissertations in a separate study (BAYRAM, 1998, p. 30), which further reinforces the fact that bibliographies of doctoral dissertations contain relatively older citations.

Similar studies of obsolescence were also carried out elsewhere. LaBorie and Halperin (1976, p. 280) found that 24% of all citations in dissertations were to sources of 0-5 years of age, 12% to sources of 6-10 years of age, 13% to sources of 11-20 years of age, and 51% to sources of more than 20 years of age. The half-life of about 20 years obtained in this study was much higher than what we reported (nine years) earlier. LaBorie and Halperin's study contained more dissertations on historical subjects citing relatively older sources, which was presumably reflected in the obsolescence rate.

The great majority (86%) of the cited sources in dissertations had single authors while 11% had two, 2% had three, and 1% had four or more. The average number of authors of cited sources was 1.2. This figure is comparable to the average number of authors of 1.3 that was reported for journal articles authored by Turkish librarians and were indexed in *Social Science Citation Index* (Gülgöz et al., 2002).

Although single authorship is the norm in librarianship as in other social science disciplines, sources with multiple authors seem to be cited more often in dissertations completed in recent years. For instance, one third of all citations to sources with multiple authors (745) came from 13 dissertations (13% of all dissertations) that were completed between 2000 and 2002. It is likely that the number of sources with multiple authors (and thus citations to such sources) will increase, as supported research projects will proliferate.

The contribution of Turkish researchers to the literature seems to be limited. Sources authored by Turkish researchers received about one third of all citations. A total of 1901 sources that were authored by 787 different Turkish researchers were cited in dissertations.



Some 20 sources authored by Turkish researchers received one third of all citations while 74 sources received one half of all citations. The contributions of more than 700 Turkish authors received only the remaining one-half all citations. This finding seems to indicate that a limited number of Turkish researchers contribute heavily to the literature of Turkish librarianship and their contributions get cited more often in the literature. The fact that a total of 94 different authors published articles in *Türk Kütüphaneciliği* between 1987 and 2001 and that the figure has almost been halved (54) since the journal became refereed in 1996 (Tonta, 2002, pp. 291-293) further supports our conjecture that more Turkish researchers should contribute to the literature in this field.

## **6. Conclusions**

On the average, a few graduate dissertations were completed at Hacettepe University Department of Librarianship between 1974 and 2002. Information centers, libraries and archives are increasingly confronted with complex issues. More graduates, equipped with the knowledge of modern information management techniques, are needed to tackle such issues.

Monographs get cited more often in dissertations than journal articles. The *Türk Kütüphaneciliği* (Journal of Turkish Librarianship), *Resmî Gazete* (Official Gazette), *College & Research Libraries*, *Library Trends*, *Library Journal*, and *Journal of the American Society for Information Science* were among the most frequently cited journals in dissertations. There appears to be no statistically significant correlation between the frequency of citations of the most frequently cited journals and their impact factors. Bradford's Law of Scattering did not seem to apply to citations over all journal titles, although citations to foreign journal titles exhibited a more Bradfordian distribution. Overlapping core journal titles were consistently cited both in master's and doctoral dissertations, and the correlation between the was statistically significant.

Doctoral dissertations contained more citations than master's dissertations since they were twice as longer. Sources published within the last eight years received half of all citations. Cited sources in master's dissertations are more current.

The number of contributions in librarianship authored by Turkish researchers was low. A small number of contributions of Turkish authors received a relatively large percentage of all citations. Similarly, articles published in the top journals in librarianship were referred to much more often than the rest. Contributions outside library and information studies were referred to much less often in dissertations. This is surprising for an interdisciplinary field such as librarianship.

Based on data obtained in this study on the most frequently cited journal titles, a core list of journals in librarianship can be developed. Libraries can subscribe to, and obtain back issues of, such journal titles. Similarly, policies regarding the procurement of articles that appeared in rarely used journals can also be developed.

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